

LIMITED THERMAL BUDGET FORMATION OF PMD LAYERS

ABSTRACT OF THE DISCLOSURE

A method of filling a gap which is defined by adjacent raised features on a substrate includes providing a flow of a silicon-containing processing gas to a chamber housing the substrate, providing a flow of an oxidizing processing gas to the chamber, and providing a flow of a phosphorous-containing processing gas to the chamber. The method also includes depositing a first portion of a P-doped silicon oxide film as a substantially conformal layer in the gap by causing a reaction between the silicon-containing processing gas, the phosphorous-containing processing gas, and the oxidizing processing gas. Depositing the conformal layer includes varying over time a ratio of the (silicon-containing processing gas plus phosphorous-containing processing gas):(oxidizing processing gas) and maintaining the temperature of the substrate below about 500°C throughout deposition of the conformal layer. The method also includes depositing a second portion of the P-doped silicon oxide film as a bulk layer. Depositing a second portion of the film includes maintaining the ratio of the (silicon-containing processing gas plus phosphorous-containing processing gas):(oxidizing processing gas) substantially constant throughout deposition of the bulk layer and maintaining the temperature of the substrate below about 500°C throughout deposition of the bulk layer.

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